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(54) Vehicle underride protective device

(57) The device 4 comprises an elongate member 7 pivotally connected to and depending from mounting means 8, such as an inverted channel-section box member 12 for attaching the elongate member 7 to a vehicle. Energy absorbing means, such as a block 19 of solid butyl rubber, is arranged between the elongate member 17 and an abutment member 14 so as to absorb energy of an impact to the elongate member. Movement of the elongate member 7 is limited by the abutment member 14.

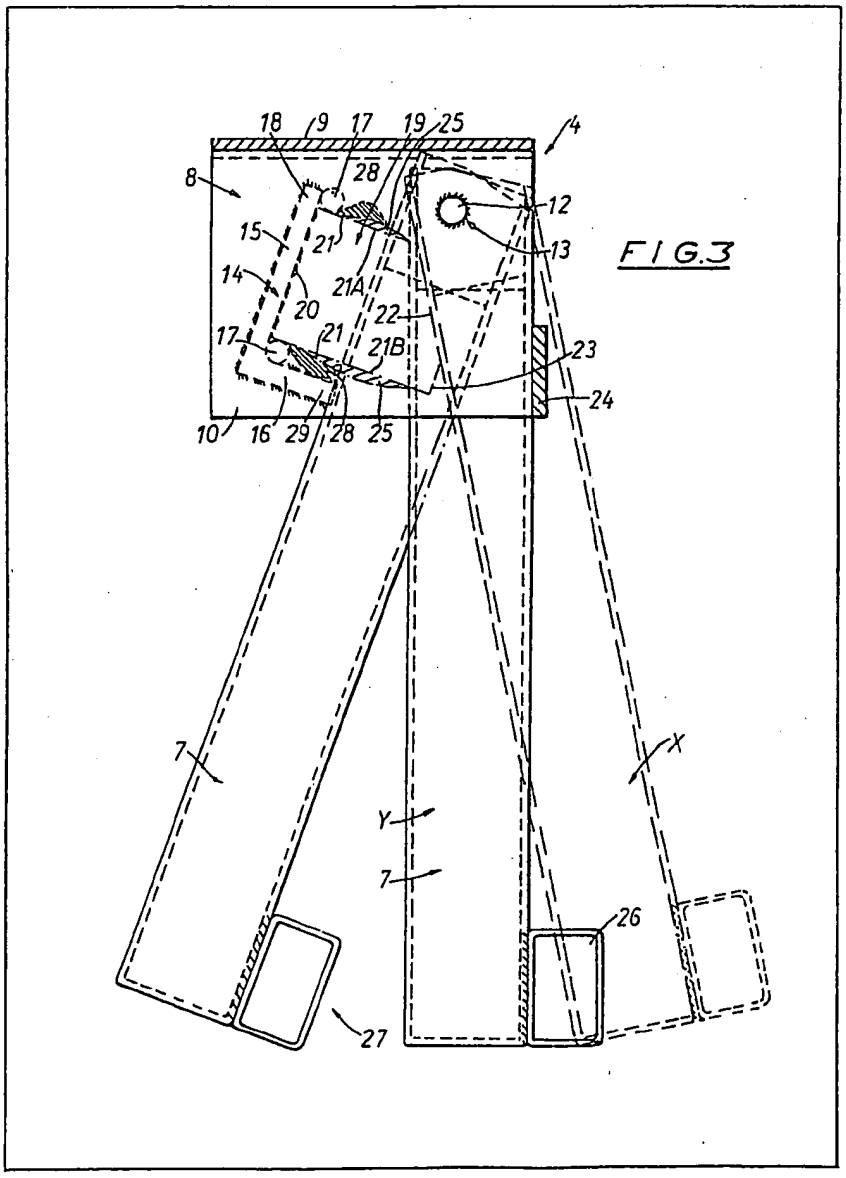

FIG.3

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The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

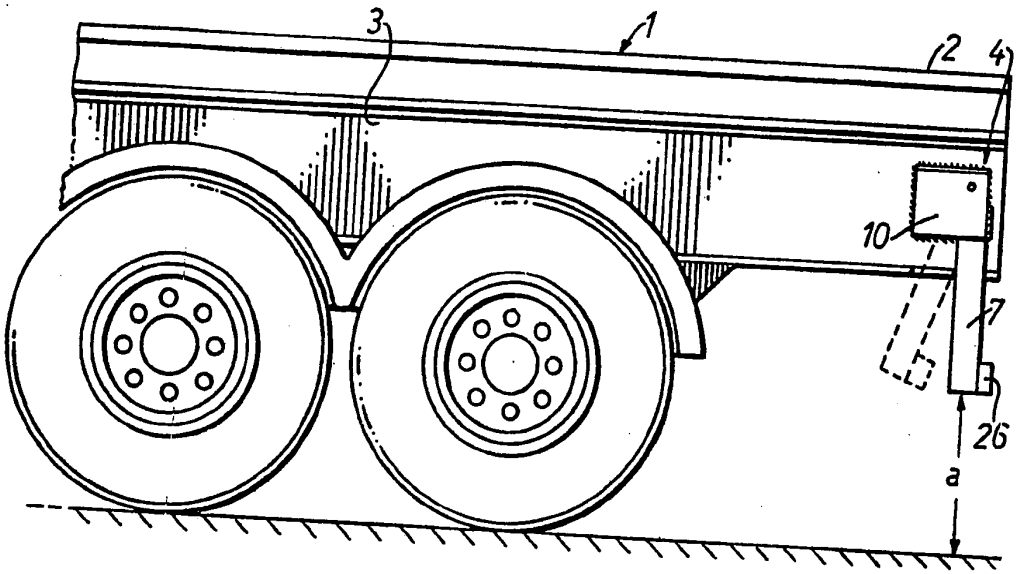

FIG.1

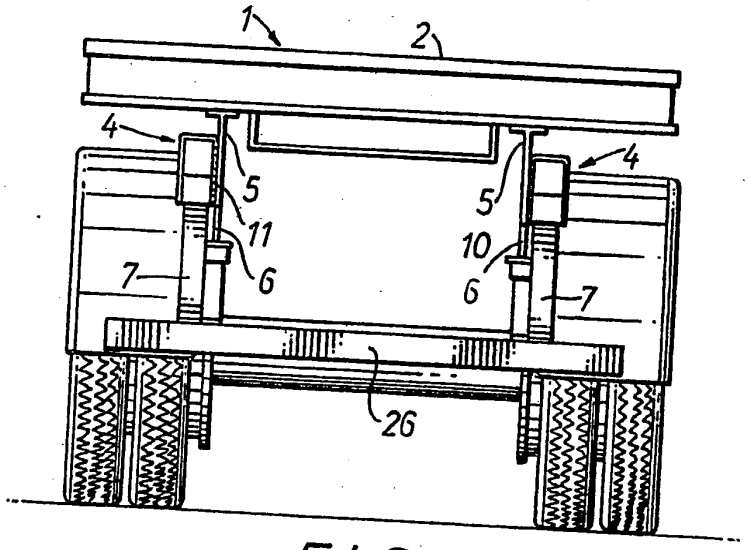

FIG.2

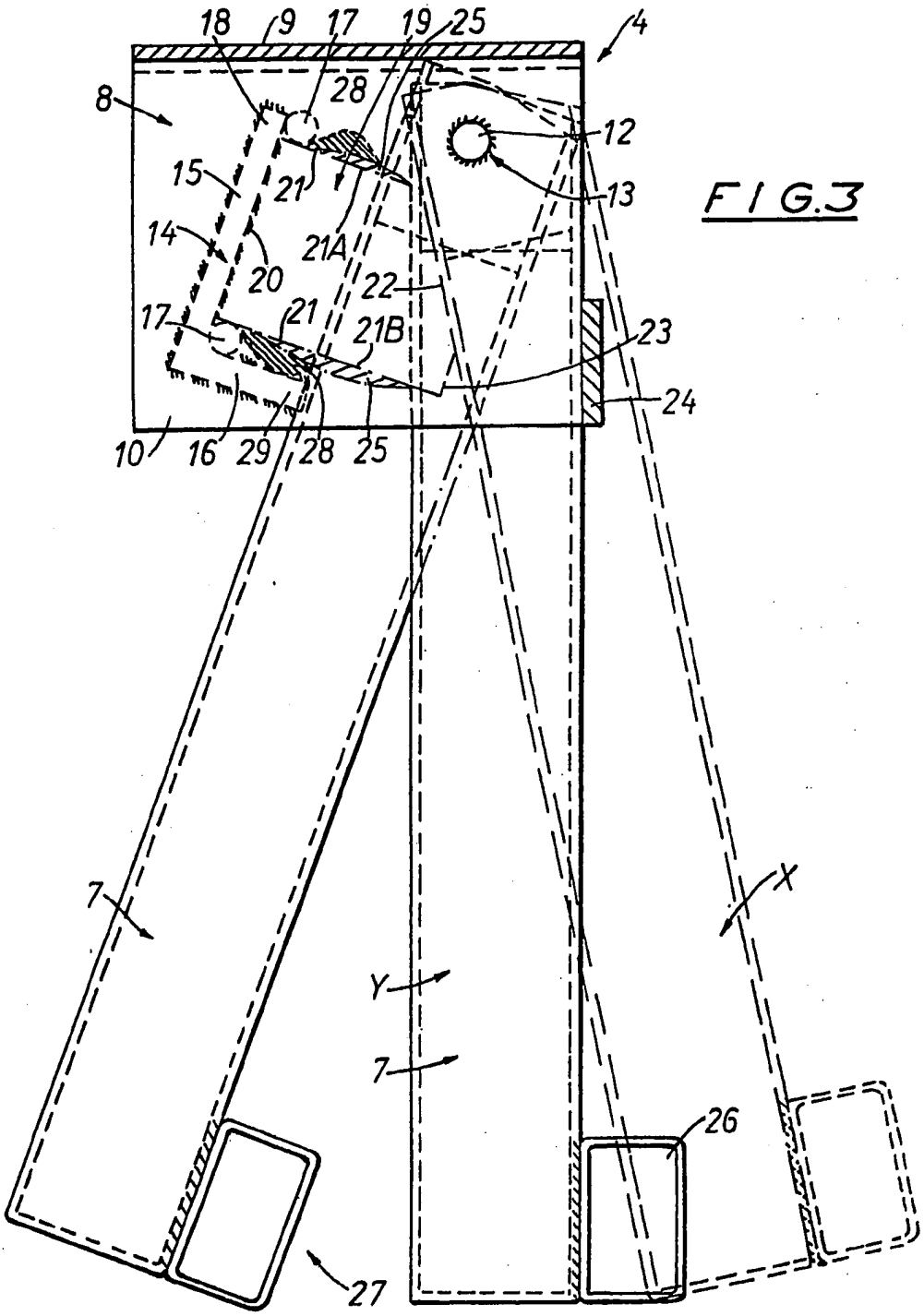
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FIG.3

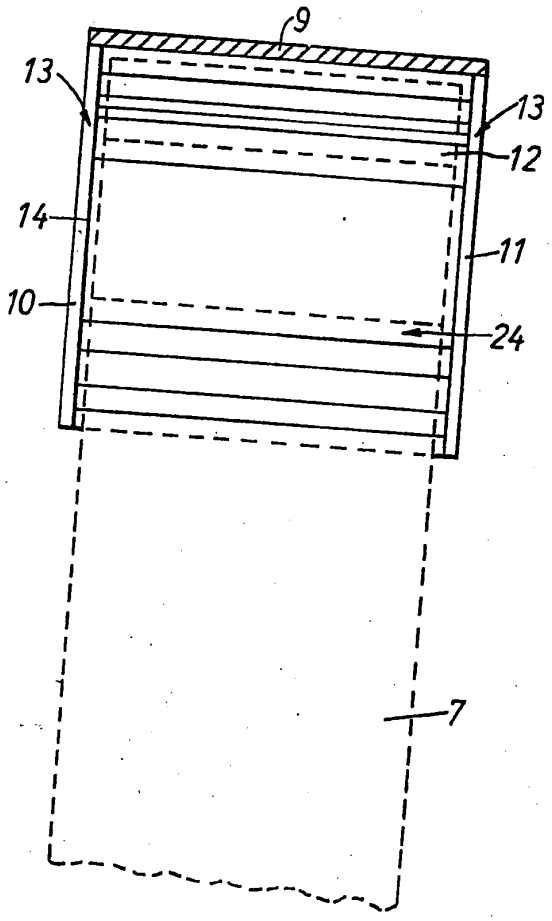

FIG.4

SPECIFICATION

Vehicl underride protective device

This invention relates to an underride protective device for fitment to a vehicle, usually but not exclusively to the rear or sides of a heavy goods vehicle, to minimise damage in the event that another vehicle runs into the back or sides of the vehicle.

It is known to provide an underride protective device depending from and fixed to the rear end of a vehicle. A known device comprises an open framework having a fixed lower horizontal member whose purpose is to prevent a vehicle approaching from the rear from being driven under the vehicle to which the device is fitted. Disadvantages of such a device include little dissipation of energy produced by the vehicle impact and a potentially large weight of the device because of the rigid structure needed.

Recent E.E.C. Regulations have lead to a further known device which comprises a horizontal member fixedly connected to two spaced apart dependent members, torsion bar(s) connected to the dependent members above the level of the horizontal member, and means for mounting the torsion bar(s) to the rear of the vehicle. The device produces a deflection which is controlled by the torsion bar(s), which thus assists in the dissipation of energy produced by a vehicle impact. The device is however relatively complex with an accompanying risk of failure of component parts. It is also necessary to have regular maintenance to prevent rust damage etc. to the device.

A further known device comprises two spaced apart drop arms, each pivotally connected within box members or the like, the box members or the like being fixed to a vehicle. A horizontal cross-beam is fixedly connected to the drop arms. The device further comprises two energy absorbers, each of which is fitted between one of the box members and its corresponding drop arm. The energy absorbers react according to the condition of the impact. Disadvantages of the device include the need to have regular maintenance as the device is relatively complex, and a need to service the energy absorbers, especially if the energy absorbers are hydraulic.

The present invention sets out to provide a vehicle underride protective device which is cheap to fabricate, easy to fit to the vehicle, cheap to maintain and reliable in use.

According to the present invention, there is provided a vehicle underride protective device which comprises an elongate member pivotally connected to and depending from mounting means for attachment to a vehicle, the elongate member being adapted for limited movement only in the direction of impact, energy absorbing means being arranged between the elongate member and an abutment member spaced from the elongate member so as to absorb energy of an impact to the elongate m mber.

The energy absorbing means may be a configured block having a location surface for abutment with the abutment member, upper and lower spaced apart surfaces extending away from the location surface towards a contact surface for engaging the elongate member, the contact surface preferably being inclined at an acute angle relative to the location surface which itself is preferably downwardly inclined from the vertical away from the contact surface, advantageously opposite thereto in the fully relaxed state of the block. When the contact surface extends from the upper surface towards the lower surface of the pair of spaced apart surfaces, the block may have a further surface which is inclined at an acute angle relative to the contact surface and which extends from the contact surface to the lower surface of the pair of spaced apart surfaces.

The configured block may be formed from a suitable synthetic polymeric material which has a high impact absorption property and which is relatively inert to adverse conditions, such as weather and/or chemical attack etc. Such a synthetic polymeric material is preferably butyl rubber. The abutment member may be a plate fixedly spaced from the elongate member preferably an angle plate. The shorter limb of the angle plate preferably defines a stop member for limiting the pivotal movement of the elongate member. The angle plate has preferably two spaced apart members, one being arranged adjacent and connected to the free end portion of the longer limb and the other being arranged at and connected to the intersection of the shorter and longer limbs. The location surface of the configured block may abut the longer limb of the angle plate between the two spaced apart members, which serve to prevent movement of the configured block relative to the longer limb of the angle plate and to provide space for expansion of the configured block on impact.

The mounting means may comprise an inverted channel section box member having a top plate and two spaced apart side plates fixed to and depending from the top plate. The elongate member may be adapted for pivotal movement within the box member, the elongated member being pivotally connected at one end portion to an elongate member extending between a pair of registered holes in the two side plates of the box member. The box member is preferably welded to a chassis or frame of the vehicle. The box member may have a plate extending between the two side plates, a plate defining means for restraining movement of the elongate member against the direction of impact.

The device is preferably used on a vehicle with a further like device spaced therefrom, a horizontal member being fixedly connected to the free end portions of the two spaced apart elongate members.

The device may be used either for fitment to the rear or to each of the longitudinal sides of a heavy goods vehicle, thus minimising or preventing a vehicle underrunning the rear or sides of the heavy goods vehicle.

The invention will now be described by way of

example with reference to the accompanying drawings, in which:

Figure 1 is a side elevation of a vehicle rear having fitted thereto a vehicle underride protective device according to the invention;

Figure 2 is a rear elevation of the vehicle rear shown in Figure 1;

Figure 3 is an enlarged side elevation of a vehicle underride protective device according to the invention; and

Figure 4 is a schematic front elevation of the vehicle underride protective device shown in Figure 3.

Figure 1 is a side elevation of the rear of an articulated trailer unit 1 of, for example, a heavy goods vehicle. In the usual manner, the trailer unit 1 comprises a load-bearing surface or flat 2 mounted on a chassis 3. Figure 1 also shows a vehicle underride protective device 4 mounted to the chassis 3 as near as possible to the rear end of the chassis 3. Recent E.E.C. Regulations have stipulated that a vehicle underride protective device must not be more than 55 cm from the ground. The free end of the vehicle underride protective device 4 shown in Figure 1 is in fact 54.6 cm from the ground (this distance being indicated by "a").

Figure 2 is a rear elevation of the rear of the trailer unit 1 shown in Figure 1. Figure 2 shows the chassis 3 of the trailer unit as comprising two spaced apart I-members 5 which depend in the usual manner from the load bearing surface of the trailer unit.

The vehicle underride protective device 4 is shown mounted to each of the I-members 5 preferably by welding one of the side plates 10, 11 to the downwardly extending web 6 of each I-member 5.

Figure 3 shows the vehicle underride protective device 4 comprising an elongate leg member 7 of generally channel-section. The elongate leg member is pivotally connected to and depends from an inverted channel-section box member 8. The box member, which serves as mounting means for connecting the leg member to a vehicle, comprises a top plate 9 having two spaced apart side plates 10, 11 which are fixed to and depend from the top plate.

The elongate leg member 7 is pivotally connected to the box member 8 via an elongate pin 12, preferably made of a high tension steel, which extends between and passes through a pair of registered holes 13, each being located in a portion of each side plate adjacent the top plate. Each hole 13 is located towards the rear most portion of each side plate 10, 11 when the box member 8 is fitted to the chassis 3 of the trailer unit.

The box 8 further comprises an abutment member 14, for example an angle plate having a longer limb being connected to a shorter limb 16. Th angl plate 14 has two spaced apart locating members 17, one being arranged adjacent and connected to the free end portion 18 of the longer limb 15 and th ther being arranged and connected to the intersection of the shorter and longer limb 16 and 15 respectively. The angle plate is fixedly spaced from the elongate member and downwardly inclined from the vertical. The angle plate is fixed connected to and extends between the two spaced apart side plates 10 and 11.

Figure 3 further shows a configured block 19 being arranged between the elongate leg member 7 and the angle plate 14. The configured block 19, which serves as energy absorbing means, has a location surface 20 for abutment with the longer limb 15 of the angle plate 14, upper and lower spaced apart surfaces 21 extending away from the location surface 20 towards a contact surface 22 for engaging an elongate leg member 7. The contact surface 22 is inclined an acute angle relative to the location surface 20 and extends from the upper surface 21A towards the lower surface 21B of the pair of spaced apart surfaces 21. When the contact surface 22 extends towards the lower surface 21B of the pair of spaced apart surfaces 21, the member 19 has a further surface 23 which is inclined at an acute angle relative to the contact surface 22 and which extends from the contact surface 22 to the lower surface 21B of the pair of spaced apart surfaces 21.

The location surface 20 of the block 19 is downwardly inclined from the vertical away from the contact surface, advantageously opposite thereto in the fully relaxed state of the block.

The configured block 19 is formed from a suitable synthetic polymeric material, such as butyl rubber. Butyl rubber has a high impact absorption property and is relatively inert to adverse conditions, such as exposure to the weather and/or chemical attack. The location surface 20 of the configured block 19 abuts the longer limb 15 of the angle plate between two spaced apart members 17, which serve to prevent movement of the configured block 19 relative to the longer limb 15 of the angle plate 14.

When fabricating the device, the configured block is located in position between the elongate member 7 and the angle point 14. At this stage, the elongate member 7 is urged by the butyl block into a position shown as "X" in Figure 3. In order to prestress the butyl block 19, the elongate leg member is moved to the vertical position, shown as "Y" in Figure 3. A plate 24 is then connected across the two side plates 10, 11 to prevent the elongate leg member being urged by the butyl block back into the position "X". The butyl block 19 is thus compressed and the upper and lower spaced apart surfaces 21A and 21B adopt a profile as indicated by the cross-hatched region 25 (Figure 3). The plate 24 restrains the elongate leg member from moving against the direction of an impact to the elongate member.

In practice, two vehicle underride protective devices 4 are used, and are connected to a vehicle rear as shown in Figure 2. A horizontal impact member 26 is fixedly connected to the free end portions of the two spaced apart elongate leg members 7.

Upon application of an impact by, for example, another vehicle, to the horizontal impact member, each elongate leg member 7, and the horizontal impact member 26, move in the direction of the arrow 27 to or towards the position of the elongate leg member shown as "Z" in Figure 3. The butyl block 19 is further compressed, and the upper and lower spaced apart surfaces 21A and 21B adopt a further profile indicated by cross-hatching 28. It can be seen from Figure 3 that the locating members 17 enable the butyl block 19 to expand without any restriction, such as by the shorter limb 16 of the angle plate 14.

The further surface 23 of the butyl block 19 is to prevent the block from engaging or "hooking" around the free end portion 29 of the shorter limb 16, which if allowed to happen may unseat the butyl block 19 from its seating between the locating members 17. Depending on the impact the movement of the elongate leg member 7 can be limited by either the butyl block 19 by itself or a combination of the butyl block 19 and the end portion 29 of the shorter limb 16, which serves as a further stop member for the elongate leg member 7. A large impact would possibly ensure that the elongate leg member 7 would bend and continue to move about a fold line adjacent to and in contact with the end portion 29 of the shorter limb 16.

Figure 4 is a front elevation showing the arrangement of the angle plate 14 and the elongate leg member 7 relative to the box member 8.

Each vehicle override protection device 14 is fixedly connected, preferably by welding, to each I-member of the trailer unit to the chassis 3. As shown in the Figures 1 and 2, a portion of the outside flanges of the I-member is removed, for example by burning off and then grinding down, to allow free pivotal movement of the elongate leg member 7.

The vehicle underride protective device of the invention is adapted to be fitted to all vehicles or trailers having an overhang extending rearwardly from the rear set of wheels of the vehicle in particular where the overhang is greater than the height of the chassis from the ground. The device is also fitted to all types of chassis construction used by commercial vehicle and trailer industries. The butyl block gives an impact resistance of from zero to 4 tonnes on each elongate leg member. Thus the total impact resistance can be up to a maximum of 8 tonnes.

Each elongate leg member is designed to give a gradual build-up to 4 tonnes and then come to a physical stop. If the impact exceeds 4 tonnes the elongate leg member itself begins to resist the impact.

The vehicle underride protective device of the invention is economic in its use of materials and servicing costs. Because of its ability to move in the direction of an impact, the device is able to negotiate various obstacles which may or may not be found during use of a vehicle having such a vehicle underride protective device fitted, in particular when loading or unl ading, and storing/securing on ships etc. The device can further provide protection to trailer hardware, such as couplings, a chassis or frame, and suspension units.

The vehicle underride protection device of the invention can also be fitted along the longitudinal sides of a trailer unit, in order to prevent vehicles from underrunning the sides of trailer units.

CLAIMS

1. A vehicle underride protective device comprising an elongate member pivotally connected to and depending from mounting means for attachment to a vehicle, the elongate member being adapted for limited movement only in the direction of impact, energy absorbing means being arranged between the elongate member and an abutment member spaced from the elongate member so as to absorb energy of an impact to the elongate member.

2. A device as claimed in claim 1, wherein the energy absorbing means is a configured block having a location surface for abutment with the abutment member, upper and lower spaced apart surfaces extending away from the location surface towards a contact surface for engaging the elongate member.

3. A device as claimed in claim 2, wherein the contact surface is inclined at an acute angle relative to the location surface which itself is downwardly inclined from the vertical away from the contact surface in the fully relaxed state of the block.

4. A device as claimed in claim 2 or 3, wherein, when the contact surface extends from the upper surface towards the lower surface of the pair of spaced apart surfaces, the block comprises a further surface which is inclined at an acute angle relative to the contact surface and which extends from the contact surface to the lower surface of the pair of spaced apart surfaces.

5. A device as claimed in any one of the preceding claims, wherein the configured block is formed from a suitable synthetic polymeric material having a high impact absorption property and being relatively inert to adverse conditions, such as weather exposure and/or chemical attack.

6. A device as claimed in claim 5, wherein the synthetic polymeric material is butyl rubber.

7. A device as claimed in claim 1, wherein the abutment member is an angle plate fixedly spaced from the elongate member and downwardly inclined from the vertical.

8. A device as claimed in claim 7, wherein the angle plate has a shorter limb relative to the other limb, the shorter limb defining a stop member for limiting the pivotal mov ment of the elongate member.

9. A device as claimed in claim 7 or 8, wherein the angle plate has two spaced part members, one being arranged adjacent and connected to the free end portion of the longer limb relative to the shorter limb, and the other being arranged and connected to the intersection of the shorter and

longer limbs.

10. A device as claimed in claim 2 or 9, wherein the location surface of the configured block abuts the longer limb of the angle plate between the two spaced apart members, which serve to prevent movement of the configured block relative to the longer limb of the angle plate and to provide space for expansion of the configured member on impact.

11. A device as claimed in claim 1, wherein the mounting means comprises an inverted channel-section boxed member having a top plate and two spaced apart side plates fixed to and depending from the top plate.

12. A device as claimed in claim 11, wherein the elongate member is adapted for pivotal movement within the box member, the elongate member being pivotally connected at one end portion thereof to the box member via an elongate member extending between a pair of registered holes in the two side plates of the box member.

13. A device as claimed in claim 11 or 12, wherein the box member has means for restraining movement of the elongate member against the direction of impact.

14. A device as claimed in claim 13, wherein the restraining means is a plate which extends between the two side plates.

15. A device as claimed in claim 11, 12, 13 or 14, wherein the box member is welded, in use, to a chassis or frame of a vehicle.

16. A device as claimed in any one of the preceding claims when used on a vehicle with a further device as claimed in any one of the preceding claims spaced therefrom, a horizontal impact member being fixedly connected to the free end portions of the two spaced apart depending elongate members.

17. A device as claimed in any one of the preceding claims, wherein the device is used either for fitment to the rear or to each of the longitudinal sides of a vehicle to prevent underrunning of the rear or sides of the vehicle by another vehicle.

18. A device substantially as hereindescribed with reference to and as illustrated in the accompanying drawings.

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